Claims

1. An ionic conduction material comprising a polymer matrix, at least one ionic species and at least one reinforcing agent, characterized in that:

- the polymer matrix is a solvating polymer optionally having a polar character, a non-solvating polymer carrying acidic ionic groups, or a mixture of a solvating or non-solvating polymer and an aprotic polar liquid;
- the ionic species is either an ionic compound selected from salts and acids, said compound being in solution in the polymer matrix, or an anionic or cationic ionic group fixed by covalent bonding on the polymer, or a combination of the two;
- the reinforcing agent is a cellulosic material or a chitin.

2. The ionic conduction material as claimed in claim 1, characterized in that the cellulosic material consists of cellulose single crystals or of cellulose microfibrils.

3. The ionic conduction material as claimed in claim 1, characterized in that the proportion of reinforcing agent is between 0.5% and 70% by weight.

4. The ionic conduction material as claimed in claim 3, characterized in that the proportion of reinforcing agent is between 1% and 10% by weight.

5. The ionic conduction material as claimed in claim 1, characterized in that the polymer matrix consists of a crosslinked or non-crosslinked solvating polymer.

6. The ionic conduction material as claimed in claim 5, characterized in that the solvating polymer carries grafted ionic groups.

7. The ionic conduction material as claimed in claim 1, characterized in that the polymer matrix consists of a non-solvating polymer carrying acidic ionic groups.

8. The ionic conduction material as claimed in

claim 7, characterized in that the non-solvating polymer carries alkylsulfonic groups or arylsulfonic groups or perfluorosulfonic groups or perfluorocarboxylic groups.

9. The ionic conduction material as claimed in claim 1, characterized in that the polymer matrix consists of a mixture of solvating or non-solvating polymer and at least one aprotic polar liquid.

10. The ionic conduction material as claimed in claim 9, characterized in that the aprotic polar liquid is selected from linear ethers and cyclic ethers, linear acetals and cyclic acetals, linear carbonates and cyclic carbonates, esters, nitriles, nitrated derivatives, amides, sulfones, sulfolanes, alkylsulfamides and partially halogenated hydrocarbons.

11. The ionic conduction material as claimed in claim 9, characterized in that the polymer is a non-solvating polymer selected from polymers which have polar groups and which comprise units containing at least one heteroatom selected from sulfur, nitrogen, oxygen, phosphorus, boron, chlorine and fluorine.

12. The ionic conduction material as claimed in claim 1, characterized in that the ionic compound is selected from strong acids and from salts of alkali metals, alkaline-earth metals, transition metals, rare earths, organic cations and organometallic cations of said acids.

13. The ionic conduction material as claimed in claim 12, characterized in that the ionic compound is selected from perchloric acid, phosphoric acid, perfluorosulfonic acids, trifluorosulfonylimide acid, tris(perfluorosulfonyl)methane acid, perfluorocarboxylic acids, arylsulfonic acids, perfluorosulfonimides and arylsulfonimides, and from salts of said acids.

14. The ionic conduction material as claimed in claim 1, characterized in that it furthermore contains an electronically conductive material and an insertion material.

15. The ionic conduction material as claimed in claim 14, characterized in that the electronically conductive material is selected from:

- carbon in the form of a fabric or powder,
- intrinsic electronically conductive polymers,
- mixtures of an intrinsic electronically conductive polymer and acetylene black,
- polymers with hybrid conduction, that is to say ionic and electronic, used on their own or with carbon.

16. The ionic conduction material as claimed in claim 14, characterized in that the insertion material is an oxide of a metal selected from cobalt, nickel, manganese, vanadium and titanium, or an iron phosphate or a graphitic compound.

17. An electrode for a battery, consisting of a composite material, characterized in that the composite material is a material as claimed in one of claims 14 to 16.

18. The ionic conduction material as claimed in claim 1, characterized in that it furthermore contains an electronically conductive material and an active material performing as a catalyst.

19. The ionic conduction material as claimed in claim 18, characterized in that the electronically conductive material is selected from:

- carbon in the form of a fabric or powder,
- intrinsic electronically conductive polymers,
- mixtures of an intrinsic electronically conductive polymer and acetylene black,
- polymers with hybrid conduction, that is to say ionic and electronic, used on their own or with carbon.

20. The ionic conduction material as claimed in claim 18, characterized in that the active material is platinum or a platinum alloy.

21. An electrode for a fuel cell, consisting of a composite material, characterized in that the composite

material is a material as claimed in one of claims 18 to 20.

22. An electrolyte for a lithium-polymer battery, in which the negative electrode consists of metallic lithium, characterized in that it consists of a material as claimed in claim 1.

23. The electrolyte for a lithium-polymer battery as claimed in claim 22, characterized in that the polymer matrix of the ionic conduction material consists of an amorphous one-dimensional copolymer or of an amorphous three-dimensional polyether network.

24. An electrolyte for a lithium-polymer battery, in which the negative electrode consists of lithiated graphite, characterized in that it consists of a material as claimed in claim 1.

25. The electrolyte for a lithium-polymer battery as claimed in claim 24, characterized in that the matrix of the ionic conduction polymer is a homo- or copolymer of vinylidene fluoride, acrylonitrile, methacrylonitrile, alkyl acrylate, alkyl methacrylate or ethylene oxide.

26. An electrolyte of a membrane fuel cell, characterized in that it consists of an ionic conduction material as claimed in claim 1.

27. The fuel cell electrolyte as claimed in claim 26, characterized in that the polymer matrix consists of a non-solvating, polar or non-polar polymer carrying acidic ionic groups.

28. The fuel cell electrolyte as claimed in claim 26, characterized in that the polymer carries alkylsulfonic groups or arylsulfonic groups or perfluorosulfonic groups.

29. A solar cell comprising a photoanode and a cathode separated by electrolyte, the photoanode carrying a conductive glass, characterized in that the electrolyte is an ionic conduction material as claimed in claim 1.

30. A supercapacitor consisting of an

electrochemical cell comprising two electrodes separated by an electrolyte, characterized in that the electrolyte is an ionic conduction material as claimed in claim 1 in which the ionic compound is a lithium or tetraalkylammonium salt, or an acid.

31. Electrochromic glazing comprising two electrodes separated by an electrolyte, characterized in that the electrolyte is an ionic conduction material as claimed in claim 1 in which the ionic compound is an acid.